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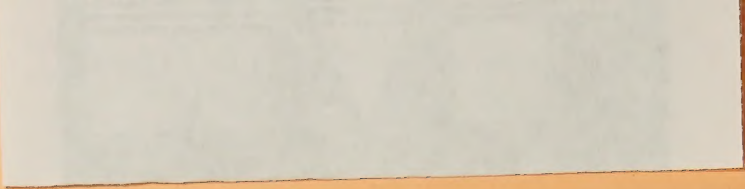
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NORTH CAROLINA

**Southern Region Projects
Supported by
Sustainable Agriculture Research
and
Education Program**





Administered by

Cooperative State Research Service, USDA
in cooperation with Extension Service, USDA
Pursuant to Title XVI, Research, Subtitle B of the
Food, Agriculture, Conservation, and Trade Act of 1990
(PL 101-624)

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from project reports

June 1991

Overview of North Carolina Projects

Congress has provided strong and growing support for the Sustainable Agriculture Research and Education grants program, also known as LISA (Low-Input Sustainable Agriculture). Administered by Cooperative State Research Service (CSRS), with the Cooperative Extension Service as a full partner, this program is forging partnerships between farmers, scientists, educators, agribusiness, non-profit organizations, and government -- a partnership that is beginning to promote better stewardship of the Nation's natural resource base. The program has supported 112 new projects since its inception in 1988; perhaps two dozen more will be funded by June.

Projects funded are typically carried out by teams of farmers, university research and education staff, government agencies, non-profit organizations, and private enterprise. Top priority is given to whole-farm integrated systems projects, usually including on-farm research and demonstrations. These projects are providing scientific documentation of low-input sustainable farming practices and systems, in comparison with conventional or chemical-intensive agriculture.

Farmer involvement is one of the strengths of this program -- 1,860 farmers nationwide have participated in projects during the first three years. When farmers participate in the planning and execution of a project, two important things happen. Concerns of farmers are foremost in the design of the project. And scientists get directly exposed to innovative ideas developed or tried by farmers. These ideas often become an integral part of scientific studies. The result is both better science and a more widespread adoption of more sustainable farming methods that are economically viable, socially acceptable, and environmentally sound, assuring cleaner water and a plentiful supply of safe food for generations to come.

The coordinators of North Carolina projects were asked about participating farmers. Here is what they reported:

- A total of 18 North Carolina farmers have participated in LISA research and education projects;
- 3 are reported to have helped generate ideas for these projects, and 7 help manage the projects;
- One farmer has provided land for replicated experiments; another 3 farmers have provided land for unreplicated studies, and 6 for demonstration plots;
- 9 are helping with the evaluation of projects.

Projects Funded 1988-1991

Eight projects funded by this program that include North Carolina scientists, farmers, or educators in major roles are described here. These projects received a total of \$440,000, and provided \$652,089 matching funds. In most of the projects, a scientist serves as the Project Coordinator. In others, a farmer or other local area residents are contributing to a multi-state project headquartered in another state.

A Comparison of Cropping Systems Managed Conventionally or with Reduced Chemical Input (LS88-9)

Summary

Experimental plots comparing conventional and low-input crop rotations were started by Larry King in 1986 at North Carolina State University. With LISA funding, his study was expanded to include several additional disciplines. The additional tests and treatments included investigation of weed management strategies, such as allelopathy; natural weed control; soil moisture relations; soil insects, nematodes, and microbiology; cycling of nitrogen, carbon, and phosphorus; economics; and extension. The first three years of the projects were characterized as summer droughts. Johnson-grass infestation was extraordinarily heavy. Because of the drought, all crop yields were below normal. The lowest corn yields were found in continuous corn plots. Somewhat higher yields were found in the low-input plots, but the highest corn yields were obtained using the conventional (pesticide-based) crop rotations.

Costs and net returns from corn, soybeans, grain sorghum, and wheat were calculated for each treatment in 1986 and 1987. Net returns were higher in virtually all of the low-input plots than in the conventional plots. Because of the drought, the net returns for most of the enterprises were negative. Conventional management in this experiment is no-till production, with heavy reliance on herbicides. Low-input methods rely primarily on crop rotations and mechanical cultivation for weed control and on legumes for nitrogen. Production cost on the conventional corn plots in 1987 was \$218 per acre; the low-input methods required \$128. Because yields were so low, the conventional corn plots incurred a net loss of \$171 per acre, compared with a net loss of \$95 in the low-input plots. The most dramatic contrast was in soybeans during 1986. Net return from the conventional soybean plots averaged a loss of \$26, compared with a profit of \$47 per acre under low-input management. As additional years of data are accumulated, this study will provide increasingly definitive conclusions about the profits and risks of low-input farming methods in this part of North Carolina.

Objectives

- (1) In an ongoing field experiment, maintain four cropping systems managed conventionally or managed with reduced rates of commercial fertilizer and pesticides (hereafter referred to as "low-input.") Monitor crop yield, cycling of N, P, and C in the soil-plant system; concentration of allelopathic compounds (phenolic acids) in soil; shifts in composition and number of soil arthropods and nematodes; microbial population and activity; soil infiltration capacity and recharge of plant available water; and economic viability of each cropping system.

- (2) For conservation tillage and natural reseeding systems, develop or adapt equipment to mechanically kill strips in winter green manure crop, no-till plant into kill strip, or allow green manure to mature seed and then cultivate through green manure residue to control weeds, leaving as much residue as possible on the soil surface.
- (3) Develop response functions based on various inputs (legumes, reduced fertilizer rates, cultivation, soil properties, etc.) and apply them to actual North Carolina farms to determine the effect of low-input methods on crop yields.
- (4) Determine the economic impact of various reduced low-input methods on farm profitability.
- (5) Develop extension programs to increase awareness of Extension agents and specialists regarding the scope and purposes of low-input agricultural systems; provide Extension agents and specialists with current and applicable research information on low-input agriculture from other studies.

Project Coordinator: Larry King, Soil Science. Soil Science Department, Box 7619, Raleigh, NC 27695-7619

Major Participants: North Carolina State University: Keith Cassel, Soil Science; Maurice Cook, Soil Science; Udo Blum, Botany; Dana Hoag, Economics and Business; Donald P. Schmitt, Plant Pathology; Arthur G. Wollum, Soil Science; A. Douglas Warsham, Crop Science.

Project Duration: June 1990 - June 1992.

Total Funding: LISA Funds: \$255,000; Matching Funds: \$405,464

Planning Funds for a Proposal on Extending the Issue of Sustainable Agriculture to Small Farms in North Carolina, Tennessee and Virginia (LS88-5)

Summary

A planning grant provided funds to develop a multi-institutional Extension project to promote the use of sustainable agriculture methods on small farms in North Carolina, Tennessee and Virginia. Project participants representing NCA&T, Virginia State and Tennessee State attended the International Conference on Sustainable Agricultural Systems held in Columbus, Ohio to better acquaint themselves with the emerging issues of LISA and their implications for small/limited-resource farmers. A visit was also made to the Rodale Research Center in Kutztown, Pennsylvania, to view and discuss agronomic research involving the reduced use of chemical fertilizers, herbicides and pesticides and the increased use of green/animal manures, and conservation tillage practices. NCA&T and Virginia State Universities hosted state conferences in 1989 that addressed the potential application of LISA technology to the establishment of viable low-input sustainable production systems for small-scale agriculture. This project has had a definite impact on 1890 institutional awareness to the issue of LISA and its application to day-to-day small scale agricultural practices in North Carolina, Virginia and Tennessee. However, the project proposal resulting from this planning grant was not funded.

Project Coordinator: M. Ray McKinnie, Agricultural and Natural Resources, P.O. Box 21928, Greensboro, N.C. 27420, Phone: (919) 334-7957

Major Participants: North Carolina A&T State University

Daniel D. Godfrey, Associate Dean & Extension Administrator; John M. O'Sullivan, Greensboro, NC.

Virginia State University

Clinton V. Turner, Associate Vice President for Agriculture and Extension; Lorenza Lyons, Assistant Extension Administrator; Mitchell Patterson, Petersburg, VA 23803, Co-Project director for Virginia.

Tennessee State University

James E. Farrell, Extension Administrator; Richard J. Winston, Co-Project director for Tennessee; Alvin E. Wade, Nashville, TN.

Project Duration: One Year (June 1, 1988 - May 31, 1989)

Total Funding: LISA Funds: \$15,000; No matching funds

On-Farm Demonstrations and Research of Low-Input Sustainable Farming (LS89-14)

Summary

Most farmers in North Carolina (NC) are interested in decreasing their dependence on chemical inputs, but do not know what alternatives are available to replace synthetic fertilizers and pesticides without reducing farm profitability. They need to see how these alternatives work on actual farms with constraints similar to their own before they are willing to risk their time and resources to make changes from conventional to lower-input practices.

The proposed project will encourage growers with small to medium-sized farms to substitute more sustainable, lower-input practices for heavy use of synthetic chemicals. Project staff and consultants will work with demonstration farmers to plan appropriate reduced-input transition sequences for their farms, establish on-farm demonstrations and applied research of alternative farming systems, and coordinate outreach programs to help other farmers adopt low-input practices. Networks of farmers, researchers, agricultural educators, and technical and marketing consultants will support demonstrations and outreach programs. This project builds on groundwork already established with a \$15,000 Planning Grant in 1988 from the USDA Low /Input Sustainable Agriculture Research and Education Program, and the Carolina Farm Stewardship Association (CFSA)'s working relationship with other agricultural organizations and institutions. It is integrated with ongoing NC projects in sustainable agriculture to maximize its educational impact.

Objectives

- (1) On-farm demonstrations and applied experiments of sustainable low-input farming practices will be established.
- (2) Farm-specific transition sequences from conventional to sustainable low-input farming will be documented.
- (3) Marketing resources needed by farmer participants for crops raised with less or no synthetic pesticides or fertilizer will be developed.
- (4) Interaction between farm participants and technical advisors who can help growers draft farm plans and solve specific farming or marketing problems will be coordinated.
- (5) Outreach programs to publicize demonstrations farms and disseminate information about possible transition methods will be administered.

Project Coordinator: William W. Dow, **Carolina Farm Stewardship Association**,
Route 3, Pittsboro, North Carolina 27312, farmer.

**Major
Participants:**

On-Farm Demonstration and Research:

Bert Moss, Lenior County, fruit and vegetable grower. He raises 7 acres of peaches, 5 acres of strawberries, 2 acres of blueberries, 15 acres of juice grapes, 3 acres of melons and varying acreage of vegetables. A majority of his marketing is pick-your-own and roadside stand. He wants to reduce or eliminate the use of methyl bromide as a fumigant on annual strawberry production and possibly organic strawberry production. In addition, his goal is to reduce total production costs and increase overall profitability.

Leonard Wood, Johnston County, vegetable producer. He raises 10 acres of various vegetables. Undersowing and intercropping of Dutch white clover (*Trifolium repens* L.) will be compared for weed suppression and nitrogen fixation for sweet corn.

Jim and Bill Wallace, Wake County, intensive grazing livestock operators. They are developing a registered Angus cow/calf operation using Voisin rotational pasture methods. At present they have 40 cows and sell at feeder and stocker auctions. Three long-term goals are to expand the carrying capacity and herd to 50 cows, improve genetic base, and develop a better market for cull calves. They will establish native switchgrass lespedesas. A comparison will monitor cost and method of establishment, forage quality, and grazing time/day. Rainfall will also be recorded.

Murray Cohen, Chatham County, organic grain and livestock operator, recently purchased 100 acres that has been chemically farmed for over 50 years. He will use his management techniques to convert this land to organic production. Soil samples will be taken to monitor the biological and chemical changes. Yield, production and economic data will also be collected.

Ken Dawson, Orange County, organic vegetable producer, recently purchased land and plans to put 9.5 acres into a legume cover and develop only .5 acre for vegetable production next year. Soil samples will be taken and yield, production, and economic data will also be collected.

Steve White, Buncombe County, transitional organic vegetable grower. He experimented with red clover and Quailhaven soybeans in green peppers last season. He will also look at intercropping green manures with vegetable crops.

Chris Holder, Randolph County, grain and livestock producer. He experimented with reducing post-emergence herbicide (poast) on no-till soybeans in 1990 and he plans to design a no-till cultivator to reduce his use of post-emergence herbicides in both corn and soybeans.

Project Duration: 35 months starting March 1, 1989

Total Funding: LISA Funds: \$115,000; Matching Funds: \$100,000

Composting Poultry Litter - Economics and Market Potential of a Renewable Resource (LS89-18)

Summary

Broiler and turkey production are major agricultural industries in the Southeastern region of the United States. Production facilities are typically concentrated within a reason-able haul distance of a processing facility. Frequently, production facilities are located on farms or in areas with insufficient cropland to assimilate all of the nutrients in the litter. Unless an economical alternative is developed, the nutrient surplus generated in these areas will likely impact the environment in a negative way, especially contaminating ground and surface water.

This project is conducting a marketing analysis to determine the potential of utilizing composted poultry litter as a renewable fertilizer resource. It is anticipated that properly composted poultry litter will generate considerable demand outside the area of concentrated broiler and turkey production particularly with increasing interests in organic fertilizer. Successful export of compost outside of the concentrated growing areas will directly reduce pollution and environmental degradation as well as providing an alternative economic enterprise to increase net profitability in the region. If successful this low input technology could be readily transferred to other broiler and turkey production areas of the country.

Objectives

- (1) To evaluate the economics, engineering and environmental impact of composting poultry litter.
- (2) To determine the potential market for composted poultry litter.

Project Coordinator: L.M. Safley, Jr., North Carolina State University, Biological and Agricultural Engineering, Box 7625, Raleigh, NC 27695-7625.

Major Participants: North Carolina State University: James C. Barker, Biological and Agricultural Engineering; S.L. Warren, Horticultural Science; T.A. Carter, Poultry Science; Philip Westerman, Biological and Agricultural Engineering; C.D. Safley, Economics and Business; J.P. Zublena, Soil Science.

Project Duration: Fifteen months (March 1, 1989 to June 30, 1990)

Total Funding: LISA Funds: \$15,000; Matching Funds: \$14,343

Influence of Integrated Pest Management (IPM) on Low Input Sustainable Agriculture (LISA) in the Southern Region (LS90-22)

Summary

The Southern Regional IPM Coordinators plan to merge Integrated Pest Management (IPM) and Low Input Sustainable Agriculture (LISA) concepts into a practical program which will meet the social, environmental, and economic needs of growers and citizens of the region. Producers will have direct input into this program. An educational publication will give growers and others background reading material. A video conference will provide examples intended to make them more receptive to the idea of farm stewardship.

Objectives

- (1) To plan a Southern Regional educational program incorporating IPM concepts into LISA programs.
- (2) To assemble and publish region-wide information on the merger of IPM and LISA systems.
- (3) To conduct a nationwide satellite video conference on the incorporation of IPM and LISA systems, following the completion of objectives 1 and 2.

Project Coordinator: Charles H. Hadden, Extension Entomology and Plant Pathology, P.O. Box 1071, **University of Tennessee**, Knoxville, Tennessee 37901-1071.

Major Participants: Richard E. Caron, State IPM Coordinator, **University of Tennessee**.

Gerrit W. Cuperus, Stillwater, OK 74078, State IPM Coordinator and LISA Project Teleconference Committee Chairperson, **Oklahoma State University**.

Michael H. Linker, State IPM Coordinator and LISA Project
Publication Committee Chairperson, North Carolina State
University.

Project Duration: One Year (March 1, 1990 - February 28, 1991)

Total Funding: LISA Funds: \$25,000; Matching Funds: \$55,000

Swine Waste: Low-Cost Alternative to Commercial Fertilizer for Production of Forage for Grazing Cattle (LS90-26)

Summary

Swine production is a major agricultural enterprise in North Carolina and the southeastern United States. Swine waste is traditionally applied to land without regard to nutrient availability or environmental impacts. In recent years, there has been a proliferation of farms on which animals are concentrated and waste is produced year-round. Land for waste disposal must be integrated into an efficient and environmentally sound waste management system. Some hog farming operations may be enhanced by including a cattle grazing component, resulting in efficient forage use and additional revenue to farms.

This proposal contains a systems approach to improving agricultural profitability and maintaining environmental quality. A swine waste management-cattle grazing system will be evaluated for its impacts on farm purchased fertilizer needs, on forage quantity and quality, soil productivity, on animal health and performance, and on environmental quality.

Objectives

- (1) To implement the system on at least two farms where interactions of low-input grass production and controlled, rotational grazing will be monitored.
- (2) To monitor ground water, soil and plant nutrient status as influenced by waste water application.
- (3) To develop and document a budget model that considers nitrogen applied, evaporated, unavailable, and recovered in animal weight gain.
- (4) To generate producer and public support for implementing the system at additional sites.
- (5) To develop educational materials and training programs for use by educational professionals and farmers in implementing the system.

Project Coordinator: J. P. Mueller, Crop Science, North Carolina State University, Box 7620, Raleigh, North Carolina 27695-7620.

Major Participants: North Carolina State University:
R. G. Crickenberger, Animal Science; J. T. Green, Crop Science; J. C. Barker, Biological and Agricultural Engineering; J. P. Zublena, Soil Science

Project Duration: Three years (March 1, 1990 - February 28, 1993)

Total Funding: \$50,000; Matching Funds: \$126,276

Improved Nitrogen Use-Efficiency in Cover Crop-Based Production Systems (LS91-35[20])

Summary

Environmental concern regarding nitrate (N) pollution of groundwater is a major problem facing agriculture in the 1990's. Winter annual cover crops, as a component of conservation production systems, can provide a means of utilizing residual or mineralized nitrate in soils during non-crop periods and thereby reduce the amount of nitrate leaching into ground water. The subsequent availability of N recovered by cover crops can also improve resource-use efficiency in sustainable production systems. This potential role of cover crops has not yet been adequately documented in field experiments.

The proposed research will be a multi-state and multi-disciplinary activity, utilizing field experiments and tracer techniques to achieve the stated objectives. Results from this research will help identify cover crops capable of maintaining soil productivity and environmental quality via efficient utilization and subsequent recycling of residual soil N. Information transfer will be accomplished through presentation at state and national meetings, publication of scientific journal articles, extension literature, and field day activities.

Objectives

- (1) Evaluate the potential of several cover crops to capture residual fertilizer N from a corn production system.
- (2) Study the field and laboratory decomposition of cover crops for the purpose of developing a simulation model to describe N release from cover crops over a wide range of soil and climatic environments.

Project Coordinators: M. G. Waggoner, North Carolina State University, Raleigh, NC; G. D. Hoyt, North Carolina State University, Mountain Research Station, Fletcher, NC;

Major Participants: W. L. Hargrove, University of Georgia, Griffin, GA; M. L. Cabrera, Athens, GA

Project Duration: 3 years

Total Funding: LISA Funds: \$179,992.00; Matching Funds: \$261,922.00

Economically Viable Production of Vegetables in the Southern Region Using Low-Input and Sustainable Techniques: A Database (LS91-32[185])

Summary

Few publications are available for farmers, extension workers, teachers, researchers or students who need technical information on commercial vegetable production in the southeastern U.S. using reduced-input or organic methods. In order to produce this type of publication, this project will compile a database of information on fertilizers, cover crops, rotations, cultivar resistances and I.P.M. protocols. This information will be made available as a manual on vegetable production. In order to make the content and format of the manual useful and accessible to farmers as well as the other potential users, in the first year of the proposed project grower groups will be canvassed for their input. Individual farmers will be identified as resources for experiential information, reviewers and possible candidates for inclusion in a later companion volume of case studies (not included in this proposal). The bibliography and database used to compile the Manual will also be made available.

Database information will come from: (1) computerized searches of The Alternative Farming Systems Information Center (AFSIC) at the National Agriculture Library, (2) Appropriate Technology Transfer for Rural Areas (ATTRA), (3) bibliographies previously compiled, (4) popular gardening literature, (5) older vegetable production literature, (6) descriptions of reduced-input vegetable production, (7) visits to research and educational centers specializing in alternative methods of vegetable production, and (8) attendance at meetings on sustainable agriculture. Material collected will be edited for relevance and reliability and organized by crop.

Final development of the database, publication and distribution will be coordinated with the LISA Information Delivery Network. Preliminary work will begin on a companion case-study volume to the manual.

Objectives

- (1) Determine the best content and format to make a manual on reduced-input vegetable production useful to farmers and extension workers as well as researchers, teachers and students. Identify particular farmers as resources and/or reviewers for the annual. Timetable: 0-6months.

- (2) Compile a database of information on commercial production of vegetables in the Southeastern U.S. using reduced-input and organic techniques such as organic fertilizers, cover crops, rotations, cultivar resistances and I.P.M. protocols. Timetable: 0-18 months.
- (3) Evaluate the material compiled for usefulness and reliability and organize into a production manual for the major vegetable crops grown in the Southeastern U.S. Timetable: 6-20 months
- (4) Disseminate database electronically, as prescribed by the LISA Information Delivery Network, standardizing language and descriptors. Recipients include the National Agricultural Library Alternative Farming Systems Information Center (AFSIC) and Appropriate Technology Transfer for Rural Areas (ATTRA). Timetable: 18-24 months.
- (5) Disseminate database in hard copy through the publication of an annotated bibliography and through a Vegetable Production Manual. Timetable: 20-24 months.

Project Coordinator: M. M. Peet, Dept. of Horticultural Science, North Carolina State University, Raleigh, N.C. 27695-7609.

Cooperators: Dr. Mike Linker, Extension I.P.M. Coordinator;
Dr. Greg Hoyt, Assoc. Prof. Soil Science (Research),
Mountain Horticultural Research Station, Fletcher, NC

Project Duration: 2 years

Total Funding: LISA Funds: \$37,000; Matching Funds: \$39,770

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